

The second is to build up the level of the ground beneath the building. This is generally not an acceptable way to achieve the finished floor level in a flood risk area. By changing the level of the ground this method may spread the floodwater into areas that may not have otherwise flooded

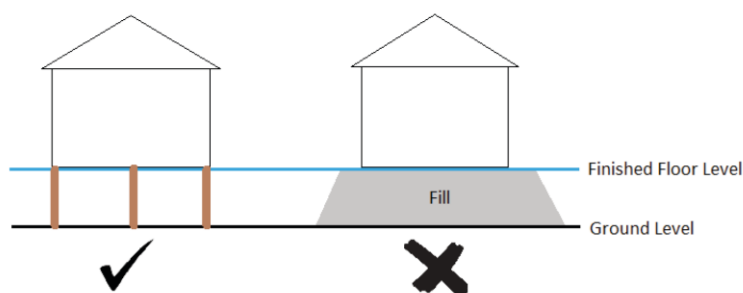


Figure I-2 Extract from Toowoomba Planning Scheme Achieving Freeboard

Recommendation

Suspended floor designs provide a sensible alternative to slab on ground houses in flood risk areas. Provided the following requirements are met, a development application may not be required:

- For low and medium risk areas the floor level is a minimum 0.8m above the DFE and this must include a minimum of 0.5m maintained from the DFE to the base of the structure (including any slung services etc)
- For high risk areas the floor level is a minimum 1.0m above the DFE and this must include a minimum of 0.7m maintained from the DFE to the base of the structure (including any slung services etc)
- If understorey screening or any other barriers are present for planning streetscape provisions, these do not take up more than 50% of the understorey area and do not impede the flow of floodwater through the understorey. Otherwise, the minimum amount of areas is to be taken up by screening
- Structures and foundations are designed in accordance with the Department Housing and Public Works – Qld Development Code MP 3.5 – Construction of buildings in flood hazard areas

Structural and Flood Resilient Building Material Requirements

Current planning scheme requirements:

The current Fraser Coast Planning Scheme requires non-habitable floor areas to be designed and constructed to be resilient to the effects of flood, up to and including the DFL. The Building Act requires certain class buildings to have structural assessment undertaken (and provides detailed links to guidance). Generally, this would not have to be repeated in the planning scheme however, the Building Act does not cover commercial or industrial type class buildings and as such a clause is required with the scheme to ensure all buildings below the DFE have structural considerations.

It is recommended that new buildings below the DFE require:

- a structural engineering design capable of withstanding the nature of the hazard(s) to which the building will be subject
- consistent with the requirements of the relevant building assessment provisions
- supported by a report prepared by a RPEQ
- identifies the flood hazard and the structural approach to be utilised
- A requirement for all classes of buildings.

The current planning scheme requires non-habitable floor areas to be designed and constructed to be resilient to the effects of flood, up to and including the DFL.

Other relevant guidance material (SPP/QRA/Other Council's approach)

TRC and BCC make reference to useful documents regarding flood resilient building materials. TRC have a requirement in the proposed scheme to require new buildings require structural engineering design in accordance with the building act.

BCC provides detailed considerations for the requirement for structural design and flood resilient building materials.

Discussion

As planning schemes cannot currently control building components, guidance documents are provided in order to meet flood resilient building requirements. It is recommended to provide some of these guidance documents in the scheme. It should also be noted that the Building Act requires certain class buildings to have structural assessment undertaken (and provides detailed links to guidance). Generally, this would not have to be repeated in the planning scheme however the building act does not cover commercial or industrial type class buildings and as such a clause is required with the scheme to ensure all buildings below the DFE have structural considerations.

Recommendation

Where buildings (both habitable and non-habitable) are located below the 1% AEP with climate change, those buildings and materials must be constructed to be resilient to the effects and impacts of flooding.

New buildings below the DFE will require a structural engineering design capable of withstanding the nature of the hazard(s) to which the building will be subject consistent with the requirements of the relevant building assessment provisions, to be supported by a report prepared by a Registered Professional Engineer Queensland that identifies the flood hazard and the structural approach to be utilised. This is required for all classes of buildings.

All new buildings should also be constructed of flood resilient building materials where below the required DFE.

Cumulative Fill impact Assessments

The cumulative impacts of fill are often specified in a planning scheme but unreasonable for developers to meet in reality. The impacts regionally or within a catchment of largely uncontrolled fill by multiple developers can be substantial and significantly increase future flood risk. Recommendations have been made for Council to undertake these assessments in high risk, high growth areas.

As these types of assessment are resource intensive, a gradual roll out of these assessments should happen. Such that the planning scheme will need to be responsive to these additions. It would be anticipated that these assessments would largely replace the maximum allowable fill (of 10m³) with a more informed figure. The assessment may also specify areas which cannot fill at all.

In order to introduce these assessments and planning control into the planning scheme it is recommended that a table indicating the areas which have cumulative fill impact assessments is included. The earthworks section within the flood overlay code would then identify:

- The maximum allowable fill volume.
- Areas which cannot have any fill allowable.
- This addition to the planning scheme could be included as a mapped output.

Siting, access and isolation

Current planning scheme requirements

The current requirements for siting, access and isolation are as follows -

'AO1.6 For reconfiguring a lot including land subject to the Flood hazard overlay or otherwise determined to be at risk of flood, the following signage is provided on-site (regardless of whether land will be in public or private ownership):-

indicating the position and path of all safe evacuation routes off the site;

if the site contains or is within 100m of a floodable waterway, hazard warning signage and depth indicators are also provided at key hazard points, such as floodway crossings or entrances to low-lying reserves.'

Recommendations

It is recommended the requirements for siting, access and isolation are updated with the following SPP guidance requirements:

- A lot for an urban purpose:
 - a) is not located in the flood hazard area; or
 - b) has a ground level above the DFE.
- Development complies with the filling requirements of table 10.
- Development in a greenfield area protects a flood conveyance area by providing an easement or reserve over the area of the premises up to the DFE.

General provisions within the planning scheme should be maintained and align with the planning scheme. The SPP provides guidance on this, and elements have been taken directly from the SPP. Elements of TRC's planning scheme have also been utilised:

- The development supports, and does not unduly burden, disaster management response or recovery capacity and capabilities.
- The road and/or pathway layout in the development provides a safe and clear evacuation path:
 - a) to ensure persons are not physically isolated from an adjacent flood-free urban area;
 - b) by locating entry points into the reconfiguration above the DFE and avoiding cul-de-sacs or other nonpermeable layouts; and
 - c) in the form of at least one evacuation route that meets the requirements below during floods up to the DFE.

Criteria	Low
Wading ability	Children and the elderly could wade (velocity x depth product <0.25)
Evacuation distances	<200m
Maximum flood depths	<0.3m
Maximum flood velocity	<0.4m/s
Typical means of egress	Sedan
Timing (requires evacuation times to be established in Council 's counter disaster plan)	Ample for flood forecasting. Warning and evacuation routes remain passable for twice as long as evacuation time

Figure I-3 Extract from Toowoomba Planning Scheme Evacuation (modified from SPP)

- Development allows for an area within the development site at or above the flood planning level with sufficient space to accommodate the likely population of the development in safety for a relatively short time until flash flooding subsides (if applicable) or people can be evacuated.

- Development ensures that:
 - a) signage is provided on a road or pathway indicating the position and path of all safe evacuation routes off the premises;
 - b) if the premise contains or is within 100m of a waterway, hazard-warning signage and depth indicators are provided at each key hazard point, such as at a waterway crossing or an entrance to a low-lying reserve.

Disaster management and recovery and business continuity

Current planning scheme requirements

The current planning scheme requirements for MCU (non-residential uses) are –

- On premises subject to the Flood hazard overlay or otherwise determined to be at risk of flood, non-residential buildings and structures: -
 - (i) are orientated to the street by activating the street frontage through ground storey business activities or urban design treatments such as recess wall treatments, screening and/or landscaping;
 - (ii) have ground storeys that allow for the flow through of flood water.

Notes—

Businesses should ensure that the necessary continuity plans are in place to account for the potential need to relocate property prior to a flood event (e.g. allow enough time to transfer stock to the upper storey of a building or off-site).

Recommendations

It is recommended the requirements for disaster management and recovery and business continuity are updated with the following SPP guidance requirements –

- Development is located to support self-evacuation of people and ensure sufficient warning time for the nature of the use.
- Development does not:
 - a) shorten warning time for other uses in the floodplain;
 - b) impact on the ability of traffic to use evacuation routes, or unreasonably increase traffic volumes on evacuation routes.
- Materials stored on site:
 - a) are readily able to be moved in a flood event to a flood- free area; and
 - b) where capable of creating a safety hazard by being shifted by floodwaters, are contained in order to minimise movement in times of flood.

Note: Businesses should ensure that necessary emergency and continuity plans are in place to account for the potential need to evacuate personnel and to relocate property prior to a flood event (e.g. to allow enough time to transfer stock to the upstairs level of a building or elsewhere).

It is recommended the requirements for disaster management and recovery and business continuity are updated with the following SPP guidance requirements –

- Development is located to support self-evacuation of people and ensure sufficient warning time for the nature of the use.
- Development does not:
 - a) shorten warning time for other uses in the floodplain;

- c) impact on the ability of traffic to use evacuation routes, or unreasonably increase traffic volumes on evacuation routes.

- Materials stored on site:
 - a) are readily able to be moved in a flood event to a flood-free area; and
 - b) where capable of creating a safety hazard by being shifted by floodwaters, are contained in order to minimise movement in times of flood.

Note: Businesses should ensure that necessary emergency and continuity plans are in place to account for the potential need to evacuate personnel and to relocate property prior to a flood event (e.g. to allow enough time to transfer stock to the upstairs level of a building or elsewhere).

Evacuation Planning

Current planning scheme requirements

The Fraser Coast Planning Scheme already contains requirement relating to evacuation which comply with the SPP, which are reproduced below –

'AO1.4 For residential buildings and temporary or moveable residential structures (e.g. caravans), a safe evacuation route is available to a gathering point and is able to be traversed by pedestrians in the DFE.'

'AO1.6 For reconfiguring a lot, any new roads provide safe, clear and direct evacuation routes that are trafficable by both vehicles and pedestrians in the DFE.'

PSP – allotments and building pads (6) Vehicle and pedestrian access from the road to the building pad must be available in the 1%AEP plus Climate Change event. Depth of inundation of the evacuation route must not exceed 300mm.

It is recommended that these be retained and supported by the following additional requirements:

- The development supports, and does not unduly burden, disaster management response or recovery capacity and capabilities
- The road and/or pathway layout in the development provides a safe and clear evacuation path:
 - a) to ensure persons are not physically isolated from an adjacent flood-free urban area;
 - b) by locating entry points into the reconfiguration above the DFE and avoiding cul-de-sacs or other nonpermeable layouts; and
- Development allows for an area within the development site at or above the flood planning level with sufficient space to accommodate the likely population of the development in safety for a relatively short time until flash flooding subsides (if applicable) or people can be evacuated.
- Development ensures that
 - a) signage is provided on a road or pathway indicating the position and path of all safe evacuation routes off the premises.

The reference to the 1 in 100 year ARI storm event should be removed and reference to then new DFE of 1% AEP plus Climate change.

Manufacture or Storage in Bulk of Hazardous Materials

Current planning scheme requirements

The current planning scheme requirement is –

'AO5 - The manufacture or storage in bulk of hazardous materials occurs above the DFL . OR Structures used for the manufacture or storage of hazardous materials in bulk are designed and constructed to prevent the intrusion of flood waters up to and including the DFL.'

It is recommended the SPP requirement for manufacture or storage in bulk of hazardous materials is adopted –

'Development ensures:

- a) the manufacture or storage in bulk of hazardous materials is located at least above the DFE; or*
- b) structures used for the manufacture or storage of hazardous materials in bulk are designed to prevent the intrusion of floodwaters'*

Draft for discussion purposes only

Avoidance responses

Vulnerable Uses

Vulnerability takes into account the characteristics of a location and/or population that influence the severity of flood impact. Vulnerabilities can include poor or under-designed infrastructure (thus reducing ability to evacuate), location of uses with vulnerable persons within flood areas, or the demographic or socio-economic characteristics of a population (including age, health, disability and other factors) which can influence a population's risk profile. For example, an aged care facility without flood protection located in a low-lying area would be considered vulnerable. Refer to '*other technical recommendations*' for a recommended list of vulnerable uses.

Current planning scheme requirements

The current Planning Scheme Policy defines the minimum lot and building pad immunity and freeboard requirements for development impacted by terrestrial flooding (figure I-4).

Zone or use		Designated flood event	% of lot above the designated flood event	Minimum surface level
Low density residential		1 in 100 year ARI	For lots < 2,000m ² , 100% of lot For lots ≥ 2000m ² , min 1,200m ² of lot	DFE + 300mm
Medium density residential, High density residential		1 in 100 year ARI	100% of Lot	DFE + 300mm
Rural residential	Lots < 1ha	1 in 10 year ARI	100% of Lot	DFE + 300mm
		1 in 100 year ARI	Min 1,200m ²	
	Lots ≥ 1ha	1 in 2 year ARI	100% of Lot	
		1 in 100 year ARI	Min 1,200m ²	
Principal centre District centre Local centre Neighbourhood centre		1 in 100 year ARI	Area dependant on the use	DFE + 300mm
Low impact industry Medium impact industry High impact industry		1 in 100 year ARI	Area dependant on the use	DFE + 300mm
Waterfront and marine industry		1 in 100 year ARI	Area dependant on the use	DFE + 300mm
Sport and recreation		1 in 5 year ARI	Area dependant on the use	DFE + 300mm
		1 in 100 year ARI	Area dependant on the use	

Open space	1 in 5 year ARI	Area dependant on the use	DFE + 300mm
	1 in 100 year ARI	Area dependant on the use	
Environmental management and conservation zone	N/A	N/A	N/A
Emerging community	1 in 100 year ARI	Area dependant on the use	DFE + 300mm
Limited development (constrained land)	1 in 100 year ARI	Area dependant on the use	DFE + 300mm
Mixed use	1 in 100 year ARI	Area dependant on the use	DFE + 300mm
Rural	N/A if no dwelling component	N/A if no dwelling component. 1200m ² of lot if containing a dwelling component.	DFE + 300mm
Specialised centre	1 in 100 year ARI	Area dependant on the use	DFE + 300mm
Community facilities	1 in 200 year ARI	Area dependant on the use	DFE + 300mm
Retirement village , equipment and vehicle depot, warehouse, childcare centre, minor public utility, police/fire stations, places of refuge, hazardous chemical storage (e.g. fuel depot)	1 in 200 year ARI	Area dependant on the use	DFE + 300mm
Medical centre , hospital, disaster management facilities, power stations, major electrical infrastructure, water and sewerage treatment plants, major telecommunications infrastructure	1 in 500 year ARI	Area dependant on the use	DFE + 300mm

Figure I-4 Terrestrial Flooding – Lot and building pad immunity and freeboard by use type

Recommendation

The new planning DFE's for vulnerable use should be read in conjunction with other recommendations for definitions of vulnerable and essential community infrastructure. The absolute minimum level of immunity is recommended to align to the requirements of the SPP.

The following recommendations for this type of use area:

- Desirably located outside of the PMF.
- Where it is located within the floodplain, a minimum DFE of the 0.5% AEP must be met for vulnerable use and a minimum DFE of the 0.2% must be met for essential community infrastructure. In addition, uses within the floodplain must submit a FREMP.

Aspects of this will be utilised for FCRC's vulnerable use and high-risk areas where risk to life is encountered. A FREMP will be triggered when use is proposed in high and extreme risk areas and all vulnerable use inside the floodplain. The FREMP must be undertaken by qualified personnel including an RPEQ engineer to determine the flood risk and an emergency management specialist to undertake other aspects.

Earthworks and Filling

Currently earthworks and filling are regulated by the planning scheme in the flood hazard overlay where the works involve:

- i) any physical alteration to existing surface formations or structures that change existing flow characteristics in a watercourse or floodway; or
- ii) excavating or filling exceeding 10m³; or
- iii) loss of flood storage exceeding 10m³.

The general allowances within the existing flood overlay code are sufficient subject to some minor amendments. In addition, any future cumulative fill impact assessments will also inform allowable fill amounts and this needs to be reflected.

In addition, there is a need to begin to control development outside of the DFE with regards to filling. Filling to achieve immunity in the DFE as the only mechanism can significantly reduce floodplain storage in larger events

Recommendation

The portion of the flood overlay code representing earthworks is recommended as follows.

- No Earthworks is permitted in extreme risk areas except for the purposes of public infrastructure due to these areas being flood conveyance areas.
- Earthworks is acceptable in floodplain extent areas and permissible in low and medium and high flood risk areas subject to:
 - i) No loss of floodplain storage exceeding 10m³ (the amount of allowable fill is also subject to available cumulative fill impact assessment areas which may specify a lesser or greater amount of permissible fill; or
 - ii) Does not Interrupt conveyance or carrying capacity of a watercourse; or
 - iii) Does not Divert or redirect flow paths and flooding to adjacent, upstream, and downstream properties; or
 - iv) Does not changes the characteristics of flow including velocity and depth; or
 - v) Does not Increases the duration flooding or decreases the time to inundation of flooding.
 - vi) Does not increase stormwater ponding on sites upstream, downstream or in the general vicinity of the subject site.

A development application may be supported by a hydraulic and hydrology report prepared by a qualified professional (RPEQ) that demonstrates development will:

- a) maintain the flood storage capacity on the subject site.
- b) not increase the volume, velocity, concentration or flow path alignment of stormwater flow across sites upstream, downstream or in the general vicinity of the subject site.
- c) avoid acceleration or retardation of flows or any reduction in flood warning times elsewhere on the floodplain.
- d) not increase stormwater ponding on sites upstream, downstream or in the general vicinity of the subject site.

It is recommended the above clause is inserted into a general place in the planning scheme (i.e. stormwater policy) to ensure all earthworks triggering aspects impeding flow etc are made assessable development (operational works).

It is recommended Council investigate the most efficient way to update its flood models into the future (i.e. improved process for obtaining final development level data, etc).

Retreat Responses

Zone Change Consideration

Where the level of risk is intolerable and sufficient studies have been undertaken to determine there is no feasible alternative, zone changes are recommended as a land use response. Any circumstance where planning change is proposed to reduce the material risk of serious harm (i.e. a planning change) requires the local government to prepare a No-FAAR. The table below provides some guidance and consideration of why considerations for high and extreme risk areas

Table I-4: Considerations for high and extreme risk areas

Risk area	Consideration	Further Action
High	<p>Possible structural mitigation measures could reduce risk to tolerable levels.</p> <p>Possible emergency management measures may further reduce residual risk.</p>	<ol style="list-style-type: none"> 1. Consider a No-FAAR for High Risk Areas* 2. Consider any assessment as impact assessable. 3. Undertake Floodplain Management Plan to determine Feasible Alternatives, investigate vulnerability and tolerability further. 4. Council undertake master planning and LGIP/financial assessment of area.
Extreme	<p>Sufficient investigation showing high flood risk from multiple factors.</p> <p>Likely no feasible/cost beneficial structural mitigation or solutions due to degree of flood depth required to be reduced.</p> <p>Emergency Management measures likely not as effective</p> <p>Areas likely to be existing defined flowpaths.</p>	<ol style="list-style-type: none"> 1. Consider No-FAAR for extreme risk areas for backzoning. * 2. Consider any assessment as impact assessable.

**No-FAAR assessments and backzoning may increase the risk of compensation without alternative solutions being investigated through a floodplain management plan. Where backzoning is considered, a floodplain management plan is recoended to be undertaken*

It is likely that compensation risk for extreme risk areas are minimised because of the clear flood risk and the likelihood these areas are within river/creek conveyance areas and/or urban drainage paths. The compensation risk does however increase for high risk areas as mitgation may be possible and Council has not undertaken any floodplain management plan (alternative measures) that can inform a No-FAAR assessment.

Considering this risk overall, it is recommended that Council do not move forward with No-FAAR assessments and potential zoning changes at this time. It is recommended that Council invest in floodplain managment planning excersises for areas that have a combination of high flood risk, highly exposed population and high likelihood and/or predetermined high areas of growth.

Appendix J | Other Technical Recommendations

Additional outputs

This section provides advice on possible incorporation of other flood risk aspects into the planning scheme.

Time to Inundation (TTI)

Proposed planning responses:

- Policy implementation could be simplified as:
 - i) Lower risk of > 6 hours' TTI
 - ii) Higher risk of < 6 hours' TTI
- The characteristics could be utilised in consideration of other flood risk factors (hazard, vulnerability etc) and used within a stipulated requirement of a Flood Emergency Management Plan to decide on applications in higher risk areas.
- In locations where there is less than 6 hours' TTI, the following is recommended:
 - iii) Investigate implementing avoidance responses (E.g. Rezoning) where located in areas which are also high or extreme flood risk.
 - iv) Avoid vulnerable uses.
 - v) Consider in FREMP when assessing evacuation for high and extreme risk areas in residential and vulnerable use.
 - vi) Considered flood islands. I.e. a flood island that submerges in a low magnitude event and has short TTI may not be appropriate to develop.

Duration of inundation

Proposed planning responses:

- Additionally, human behaviour is unpredictable and people's tolerability for uncomfortable situations is very different. Regardless excluding any known hazard and being able to set a period of time where people are comfortable verse uncomfortable the following criteria could be applied:
 - i) Lower risk of < 12 duration of inundation
 - ii) Higher risk of > 12 duration of inundation
- The characteristics could be utilised in consideration of other flood risk factors (hazard, vulnerability etc) and used within a stipulated requirement of a Flood Emergency Management Plan to decide on applications in higher risk areas. Consideration of the burden on emergency services is also a vital piece of the FREMP.
- In locations where there is a duration of more than 12 hours of inundation the following is recommended:
 - i) Avoid vulnerable uses.
 - ii) Consider in FREMP when assessing evacuation for high and extreme risk areas in residential and vulnerable use.
 - iii) Considered flood islands. I.e. a flood island that submerges in a low magnitude event and has a long duration of flooding adds to the risk of fatalities. In addition, on high flood islands, resupply and rescue starts to become more urgent as flood duration increases.).
 - iv) Considered in FREMP reports particularly in high risk areas (where there is threat to life). It is likely that combining these factors that development becomes less appropriate. The longer residents remain sheltered in place, the more likely they may make emotional decisions to leave during flood events.

Flood Islands

Proposed planning responses:

- As flood islands present a difficult flooding situation both from hazard, discomfort and rescue, future development should be avoided where possible.
- Vulnerable use classed as intolerable on both low and high flood islands.
- Residential use intolerable on very low flood islands (i.e. road flooded early, and island flooded in 0.2% AEP).
- Residential use intolerable where a short TTI exists on a low flood island.
- Residential use intolerable where a long duration exists on a high flood island.
- Evacuation route immunity is also another key piece of consideration and may also be a risk that is recommended to be mitigated by Council when designing new roads, or developers through the development assessment process.
- The characteristics could be utilised in consideration of other flood risk factors (hazard, vulnerability etc) and used within a stipulated requirement of a Flood Emergency Management Plan to decide on applications in higher risk areas. Consideration of the burden on emergency services is also a vital piece of the FREMP.

Fill Impact Assessments

Proposed planning responses:

- i) Identification of areas which are acceptable, not acceptable or areas requiring more information in order to fill.
 - ii) Providing maximum filling provisions or nominating different housing type requirements (suspended floors etc).
- In order to introduce these assessments and planning control into the planning scheme it is recommended that a table indicating the areas which have cumulative fill impact assessments is included. The earthworks section within the flood overlay code would then identify:
 - i) The maximum allowable fill volume.
 - ii) Areas which cannot have any fill allowable.
 - iii) This addition to the planning scheme could be included as a mapped output.

Definitions

This section provides an overview of the definitions required in accordance with the SPP and modification to suit Councils planning scheme.

Vulnerable Uses

State legislation and the SPP do not define community infrastructure uses. The SPP Guidance Material - Natural hazards, risk and resilience (flood) identifies a range of vulnerable uses. The following are a suite of vulnerable uses for Council's consideration in the Fraser Coast region –

- Childcare centre
- Community care centre
- Community residence
- Community use
- Detention facility
- Educational establishment
- Emergency services
- Hospital
- Non-resident workforce accommodation
- Relocatable home park
- Residential care facility
- Retirement facility
- Rooming accommodation
- Rural workers' accommodation
- Tourist park

Sensitive Uses

A definition of sensitive land uses is provided in the *Planning Regulation 2017*. The following are a suite of sensitive uses for Council's consideration in the Fraser Coast region –

- Caretaker's accommodation
- Childcare centre
- Community care centre
- Community residence
- Detention facility
- Dual occupancy
- Dwelling house
- Dwelling unit
- Educational establishment
- Health care service
- Hospital
- Hotel, to the extent the hotel provides accommodation for tourists or travellers
- Multiple dwelling
- Non-resident workforce accommodation
- Relocatable home park
- Residential care facility

- Resort complex
- Retirement facility
- Rooming accommodation
- Rural workers' accommodation
- Short-term accommodation
- Tourist park

Community Infrastructure

State legislation and the SPP does not define community infrastructure uses. The SPP Guidance Material - Natural hazards, risk and resilience (flood) identifies a range of community infrastructure uses in *Table 18: minimum flood immunity standards for infrastructure*. The following are a suite of uses for Council's consideration for community infrastructure involving vulnerable uses and infrastructure that must continue operating during and immediately after a flood event in the Fraser Coast region –

- Uses involving vulnerable persons:
 - i) Retirement village
 - ii) Residential care facility
 - iii) Facility where an education and care service under the Education and care Services National Law (Queensland) is operated or a childcare service under the Childcare Act 2002 is conducted
 - iv) Correctional facility
 - v) Education establishment
- Infrastructure that must continue operating during and immediately after a flood event:
 - i) Any transport infrastructure as defined by the Regulation
 - ii) Hospitals and associated institutions
 - iii) emergency services facility (e.g. including police facilities)
 - iv) water cycle management infrastructure (water treatment plant)
 - v) facilities used as an evacuation or recovery facility in addition to their normal function (e.g. sporting facility, community centre, meeting hall)
 - vi) cemetery and crematorium
 - vii) sporting facility, community centre, meeting hall (where not used as an evacuation or recovery facility)
 - viii) waste management facilities
 - ix) storage and works depots and similar facilities, including administrative facilities associated with the provision or maintenance of the community infrastructure mentioned in this part
 - x) gallery, museum, library and any other similar community/cultural facility/use
 - xi) any other infrastructure as defined by the Regulation

Draft for discussion purposes only

Fraser Coast Regional Council

Flood Risk and Emergency Management Plan

Development Requirements

Draft for discussion purposes only

1 Table of Contents

1	Table of Contents	2
2	Overview	3
3	Frequently Asked Questions	4
4	Report Template	6

Figures List

Figure 2-1	SPP Flood Risk	3
Figure 3-1	ISO 31000: 2018 Risk Management Process.....	4

Draft for discussion purposes only

2 Overview

The State Planning Policy requires Fraser Coast Regional Council to holistically manage flood risk in development works across the Council jurisdiction. An extract of the relationship between land use planning and floodplain management from the SPP is shown here:

Flood risk management and land-use planning Planning is recognised as a key policy lever for influencing the level of future natural disaster risk. The state therefore has an interest in ensuring that land-use planning practice supports the achievement of flood risk management and community resilience objectives. These objectives include:

- *improving community awareness of flood risk to individuals, their property and their communities*
- *minimising damage to property, infrastructure and the carrying capacity of the environment*
- *supporting disaster management response or recovery capacity and capabilities*
- *maintaining operation of critical infrastructure during and following events, and minimising exposure of vulnerable uses to direct damage or isolation from flood events*
- *minimising recovery costs by helping to increase social, economic and environmental resilience*
- *encouraging and supporting continuous improvement in flood risk management capacity and capability.*

Council's planning scheme and the responses are targeted at providing risk treatment to reduce existing flood risk and exposure by providing information regarding the frequency and hazards in areas. This information then categorises this risk into floodplain extent, low risk, medium risk, high risk and very high risk. Further information regarding categorisation of these risks can be found in Council's flood overlay code.

Within Council's planning scheme some particular uses are not provided the necessary level of risk treatment to reduce this risk to a tolerable level. Examples of these uses include residential and commercial uses within the high and very high risk zones and vulnerable use within the floodplain. The residual risk that remains that is intolerable requires additional requirements to investigate and provide further risk treatment through a Flood Risk and Emergency Management Plan.



Figure 2-1 SPP Flood Risk

3 Frequently Asked Questions

Below is a set of possible FAQ's with regards to the FREMP requirements.

What is a Flood Risk and Emergency Management Plan and when is one required?

A flood risk assessment is a means of identifying and managing the existing, future and residual risks of flooding and it is required and triggered under Council's planning scheme for certain types of use in certain flood risk areas due to the degree of untreated risk remaining, An FREMP must be prepared in accordance with the framework outlined in *ISO31000:2018 Risk Management Guidelines*. Other guidelines such as the Australian Institute of Disaster Resilience also provide a library of relevant guidelines with regards to flood risk and emergency management.

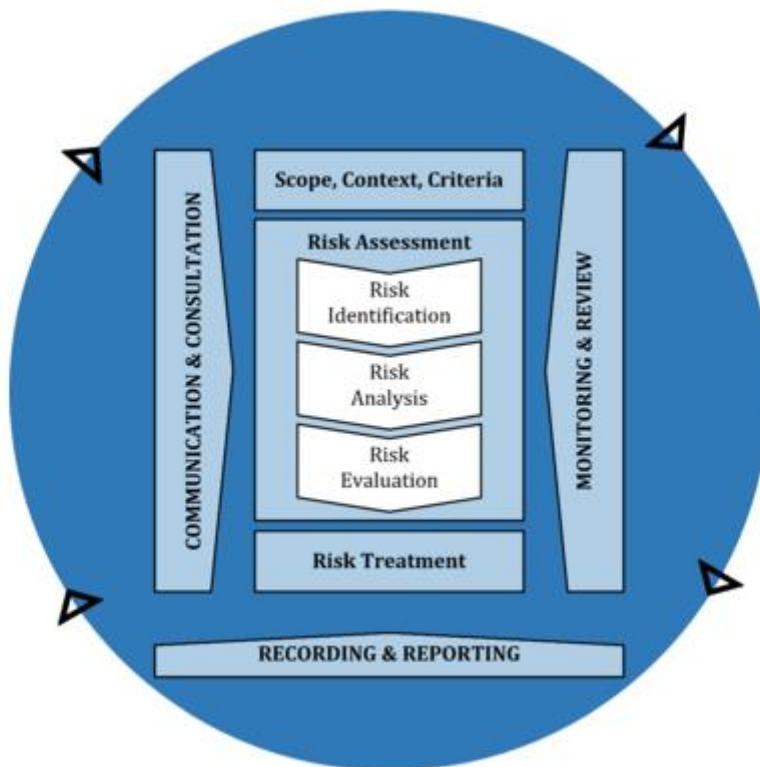


Figure 3-1 ISO 31000: 2018 Risk Management Process

An FREMP must be prepared and certified by an appropriate professional depending on the context of the FREMP. The emergency management aspects of the FREMP are particularly important when vulnerable use is proposed within the flood risk area as risk is increased due to the limitations and ability of vulnerable people during floods to respond.

Where commentary and assessment is required on flood frequency, hazard and interpretation of flood risk, A Register Professional Engineer of Queensland (RPEQ) must prepare, approve and sign off this document.

Where aspects of emergency management are being discussed and implemented to reduce risk, an experienced and/or qualified emergency/disaster manager is preferred to develop this portion of the plan. If an RPEQ is utilised for this portion of the plan, the RPEQ must be experienced in this area (trained or experienced in areas of planning, response and recovery in disasters).

What happens to a FREMP during and after the development assessment process?

Council will assess the risk assessment and emergency management plan during the development assessment stage. It is likely that the FREMP will be mentioned in the conditions package, and conditions may also include a timeframe for a review of the Flood Emergency Management Plan. The condition will be enforceable. The Flood Emergency Management Plan will not be stamped “approved” by the Council, any risk is borne by the author of the plan. The leftover residual risk committed to by the author with the proposed risk management measures is at the sole risk of this author.

Evaluation, maintenance and review of the FREMP is the requirement of the property owner and the risk is borne by the owner to ensure all requirements of the FREMP are met.

What other information can be provided by Council to inform the FREMP?

Council can provide information (if available) such as flood model results and other outputs such as time to inundation and duration of flooding in particular areas.

Areas that are affected by fast flash flooding (less than 6 hours as specified by BoM) are likely unable to provide sufficient warning time to residents and owners thus:

- Increasing the risk of harm/fatalities associated with high hazard areas;
- Providing insufficient warning time to reduce flood damages (by being able to relocate valuables to higher ground or remove altogether)
- Reducing the ability to safely evacuate
- Increasing the burden on emergency services who may need to perform urgent rescues

Areas that have less than **6 hours time to inundation** are likely to have little management measures, and the residual risk left will likely be too high. These aspects should be considered very carefully by the FREMP author as limited warning times prevent risk reduction practices.

Areas that have durations of flooding greater than **12 hours** (particularly low set and slab on ground structures) generally have greater flood risks and management of these risks made more difficult. Long durations of flooding will:

- Elevating psychological trauma and stress during flood events often leading to poor decision making by occupants
- Increasing the risk of medical issues (heart attacks etc)
- Isolating people from evacuation for longer periods of time
- Increasing the disruption associated with the length of flooding (unable for others to access the use and staff/residents unable to access other areas during this time) decreasing resilience of the community overall
- Increasing the burden on emergency services who may need to perform rescues based on aspects above

Both the time to inundation and duration of inundation can be supplied by Council and the issues above will need to be considered by the author. Areas affected by these additional flood risks are not recommended to proceed unless adequate and practical mitigation and management measures can be put in place without increasing the overall burden to Council and emergency services overall.

What information should be considered in flood warning assessment?

Factors that should be included in considering warning time include but are not limited to:

- Combinations of different sources of flooding including riverine, creek, overland and coastal flooding. Each of these elements must be considered separately and jointly to determine the most critical and combined increases of flood risk.
- Available warning mechanisms in the catchment (gauges, BoM) and how these aspects can be translated into useable information for the use
- The time required to mobilise State Emergency Service resources and communicate flood and evacuation warnings to affected areas;
- The considerations, preparation time and practicalities of self-evacuation
- The considerations, preparation time and practicalities of any forced or organised evacuation from QPS and SES
- Considerations that evacuation routes may be cut off before (and not traversable) before buildings are inundated
- Assessing evacuation capability including the immunity, expectations of traffic using the road (affecting capacity) and the time taken to evacuate and move along the route. Evacuation capability should consider the needed warning time in consideration of the time taken to successfully evacuate. In flash flood catchments, evacuation will likely not be feasible considering this

Appropriate documentation from Queensland Fire and Emergency Services and AIDR should be consulted for a full range of considerations in flood warning and evacuation requirements.

4 Report Template

The following information is provided as guidance only, the report author is required to assess the site and its residual risk and make an informed decision on the assessment and management of the site as the risk is borne by the author. Different use types, different flood risks and other unique aspects may require a different levels of information and assessment to inform these assessments.

Whilst all use types and circumstances must follow the risk management process, non-residential uses (such as commercial and industrial) will also require additional assessment. These uses can play a particularly important role during planning, response and recovery during flood events and increase the flood resilience of the overall community. Business's that are affected by flooding reduce Council's and the communities flood resilience and the impacts of these business's being affected must be assessed. Business continuity plans are also a requirement for these types of uses to minimise the impact of flooding and must be included in the FREMP.

Table of Contents

Introduction

To be completed for all FREMP's, to include:-

- Purpose of the FREMP
- Proposed development details
- The type of use and how it may be further affected by flooding (vulnerability)
- Site location
- Data available
- Summary of flood risk affecting the site and flood information used to inform this

Flood Risk Assessment

Information such as

- Number of people likely to be at risk and who may need to be evacuated;
- Increased flood risks during larger flood events such as the PMF;
- Suitability of time to inundation, duration of inundation and overall flood warning times;
- Evacuation routes - including vertical evacuation, or events of isolation;
- Any additional burden placed on emergency services and how this would be managed;
- Length of flood recovery and social and economic impacts;
- Identification of critical electrical circuits and other systems and mitigation of impacts;
- Identification of hazardous goods, and mitigation of any environmental impacts;
- Climate change and future changes to flood risk
- Likelihood and consequences of flooding;
- Consideration to building and contents damages from flooding and flood resilient design ;
- Economic impacts including downtime during flood recovery on businesses, impact on employees and the overall affect of decreased flood resilience to the community; and

Flood Risk Management and Mitigation Strategies

Measures can include but not be limited to:

- Method of notifying risk management data to current users and future owners and leaseholders, including options such as legal documentation or notation on titles;
- Strategies to reduce structural, internal and external damages through flood resilient building materials
- How risk to people from the flood hazard has been minimised;
- How the disruption to residents, business or site operations and recovery time due to flooding have all been considered and minimised;
- Procedures to conduct emergency flood management, evacuation and rescue operations
- How the required mitigation and management strategies can be employed through appropriate forms of legal documentation, notation on titles and methods for conveying the risk management data to future owners and leaseholders

Flood Response Duties and Procedures

Prior to, during and following a flood event, a full list of procedures needs to be developed considering the flood risk overall inclusive of likelihood, consequence and vulnerability of the use. Guidance for this can include:

- Procedures during the flood event and triggers to understand the flood event is occurring.
- Requirements of procedures after these triggers have been identified
- The parties responsible for planning and responding to this triggers and procedures. An indication of how their flood awareness and understand provides the capability to respond
- How this information is portrayed throughout the building (evacuation routes, assembly areas, procedures, risks etc)
- How staff and/or residents are trained and awareness increased
- How practice assignments are undertaken and drills considering a range of circumstances
- Relevant contact details and information sources (SES, Council, BoM etc)

FREMP Review

Considering needs to be provided for how and how often the FREMP will be reviewed, particularly emergency management components. The review will need to consider:

- What enables the review
- How often the FREMP needs to be reviewed
- How the review will be legally enforced
- Consideration of change of ownership/residents etc.
- Who will be held accountable for the review and how will the person be held to account to ensure the review is undertaken

Summary and Conclusion

To be completed for all Flood Risk Assessments, to include

- Summarising the site risks and whether these residual risks have been mitigated and managed to a safe, practical and effective level
- Experience and qualifications of report author(s).
- Limitations and Assumptions

Appendix L | Assumptions and Limitations

The work undertaken in this report and project, is subject to the following limitations and assumptions:

- All data provided was assumed to be accurate and fit for purpose. The outcomes of the risk-based mapping rely on the accuracy of the existing flood models and no review or detailed checks have been undertaken of these models. Electronic flood models were not provided as part of this project.
- Hazard outputs were not available from the existing flood studies. Hazards were reproduced from the combination of depth, velocity and VD products in accordance with AIDR. Flood Risk categories were subsequently created through a python script.
- Initial liaison with Council provided direction that residential control was not to exceed the 1%AEP flood event. This largely constricts the ability to undertake some functions of assessing multiple frequencies. The PMF event was however adopted in place of this limitation.
- Instruction was provided by Council to separate hazards between H1 and H2. This created an additional risk category.
- The risk-based approach was limited to the 1% AEP events provided. Events below the 1% AEP were not provided largely due to the inconsistency across multiple model sets and this restricts the ability to manage high frequency floods.
- Requests to modify flooding behaviour and separate creek and overland flowpath flooding were not able to be undertaken as flood models were processed as one data set. Should Council wish to separate flood sources, two models would be required to be constructed and run to provide this. Assessment and options have been provided with regards to this.
- Aspects of this report and recommendations have been formed with joint consultation with Council. As direction has been provided to Synergy Solutions on some of these elements, Synergy accepts no liability for these directions.
- Recommendations for prioritising future flood studies and other outputs assume limited resourcing. Ultimately, all flood studies and outputs are required.
- Significant scope revision (descoping) occurred throughout the project to remove the requirement to undertake detailed assessment of codes and planning scheme assessment. The report provided reflects this reduction in scope and the contents require further work to be implemented within the planning scheme.
- Recommendations have been made without an understanding of community tolerance to flooding or the fortune of having detailed and extensive community consultation and engagement.
- Understanding flood risk requires holistically and in detail requires flood risk and floodplain management plans. As Council do not possess these resources or outputs, this has limited the understanding of overall risk in specific catchments.